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ABSTRACT

Materials contained in this guide present competencies describing auto mechanics skills necessary for success in initial employment or applicable to advanced educational placement, and may be used by administrators, students, and secondary and postsecondary vocational teachers. The student outcomes section provides guidelines for planning of and preparation for job opportunities and placement, for advanced placement in postsecondary education, and for allowing high school credit for previous experience. Section 2 lists eleven auto mechanics competencies needed for initial employment (e.g., being able to analyze and service engines, cooling systems, power trains). Under each competency is a description of circumstances under which the student will demonstrate the skill and a list of criteria of acceptable performance. A third section lists enabling tasks for each competency, describing activities necessary for developing a particular job skill. A glossary, a form for recording student achievement, and a class progress chart are also included. (TA)

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competencies for articulation

AUTO MECHANICS

CE 015 159

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A Project of the
Lincoln Public Schools
Educational Service Unit No. 6
Southeast Community College

COMPETENCIES FOR ARTICULATION

AUTO MECHANICS

An Exemplary Project in Vocational Education
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PREFACE

More emphasis than ever is being given to educational competencies. The public is questioning the basic abilities of graduates and is demanding that schools be more accountable for student performance. Educators are determined to give a clear definition of what students are expected to learn.

Although many people are interested in competencies, few seem able to explain what they mean or give specific examples. Staff members of this project can. They have addressed an important problem—articulation between schools—in terms of the competencies the students should have.

Defining competencies will not necessarily improve articulation. That improvement demands understanding, trust and cooperation among all concerned. Neither does the definition assume full-fledged, competency-based education – for that requires a complex system for instruction, assessment and certification that takes time to develop.

While these competency statements are not the whole picture, they are a significant achievement. If used properly, they will contribute to both better articulation and improved learning.

Ron Brandt,
Associate Superintendent for Instruction
Lincoln Public Schools

ACKNOWLEDGEMENTS

The significant contributions of committee members in the development of these materials are greatly appreciated. Members representing three educational agencies, the Lincoln Public Schools, Educational Service Unit No. 6 and Southeast Community College, combined skills to provide helpful materials for articulation purposes to teachers and administrators.

Persons representing business and industry in Lincoln, Milford and other cities in the Educational Service Unit and the Southeast Community College area also contributed expertise through a series of meetings. Vocational teachers from Lincoln and other communities, although not directly involved in the project, made similar contributions as materials were developed.

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INTRODUCTION

Professional staff members of the Lincoln Public Schools, Educational Service Unit No. 6, and the Southeast Community College have joined with representatives of business and industry in developing these instructional materials.

The educational materials in this guide may be used by administrators, students, and secondary and post-secondary vocational teachers. They are designed to help students move from class to class, grade to grade, secondary studies to post-secondary school or employment. The materials consist of:

1. Student Outcomes
2. Competencies for Job or Advanced Placement
3. Enabling Tasks
4. Glossary of Terms
5. Record of Individual Student Skill Achievement and
6. Class Progress Chart

This information is not limited to a particular vocational course but to a set of competencies. These competencies describe skills necessary for success in initial employment or applicable to advanced placement for educational purposes.

Some schools may be able to provide more opportunities for students to complete competencies and tasks than others. Whatever the case, teachers and administrators will find the materials helpful when planning programs for students and for determining what educational experiences may be made available to them. Students may use the materials to understand and plan the skill developments necessary for employment and additional education.

Teachers and students should keep records of competencies as they develop. Two record forms, one for charting competencies of all students in a class, the other an individual student record, are included in the materials. These records may be used by students and teachers to chart progress toward specific job skills, and as achievement records for presentation with job or post-secondary school applications.

Student Outcomes

Information that will help administrators, teachers and students plan programs at both secondary and post-secondary levels is provided. It applies to:

1. Planning of and preparing for job opportunities and placement;
2. Planning of and preparing for advanced placement in post-secondary education;
3. Allowing high school credit for previous experience.

"Student outcomes" describe what a particular instruction has prepared a student to do.

JOB OPPORTUNITIES

Many automobile mechanics positions available in the Lincoln community and in surrounding areas are listed along with the Dictionary of Occupational Titles and the Office of Education codes.

Recommended competencies to be developed by students for initial employment are given. Students may use this information to plan and prepare school experiences properly.

Dictionary of Occupational Titles Code Number	Office of Education Code Classification	Occupational Title	Competencies Necessary for Initial Employment	Recommended Additional Training
289.358	04.03	Salesperson, Automotive Parts	1 through 11	Marketing-Merchandising
620.131	17.0302	Automobile Service Mechanic	1 through 11	----------
620.281	17.0303	Transmission Mechanic	8, 11	----------
806.884	17.0303	Automobile Accessories Installer	3, 5, 11	Electronics, Metals
620.281	17.0302	Automobile Mechanic	1 through 11	Machine Shop
620.281	04.03	Automobile Repair Service Estimator	1 through 11	Marketing-Merchandising
620.281	17.0302	Automobile Tester	1 through 11	----------
620.281	17.0303	Brake Repairer, Automobile	3, 11	----------
620.281	17.0303	Carburetor Mechanic	3, 4, 11	----------
620.381	17.0303	Differential Repairer	7, 8, 9	----------
825.281	17.0303	Electrician, Automotive	3, 5	Electronics
620.281	17.0303	Engine Head Repairer	1, 2, 6	Machine Shop
620.281	17.0303	Front-End Mechanic	7, 9	Metals
825.281	17.0303	Ignition and Carburetor Mechanic	3, 4, 5, 11	Electronics, Physics
915.887	17.0303	Lubrication Servicer	2, 11	----------
807.884	17.0303	Muffler Installer	10	Gas Welding, Metals
806.381	17.03	New Car Get-Ready Mechanic	3, 4, 5, 6, 11	Electronics
915.884	17.0303	Tire Repairer	11	----------
620.281	17.0303	Tune-up Mechanic	3, 4, 6, 11	Electronics, Physics
620.381	17.0303	Automobile Radiator Mechanic	6	Gas Welding, Metals
620.381	17.0302	Automobile Service Mechanic I	2 through 11	Electronics, Metals
620.884	17.0302	Automobile Mechanic Helper	1 through 11	----------
915.867	04.16	Automobile Service Station Attendant	11	Marketing-Merchandising
620.281	17.0302	Automotive Mechanic Apprentice	1 through 11	----------

ADVANCED PLACEMENT POLICY STATEMENT

Southeast Community College
Lincoln and Milford Campuses

The College believes that students should be recognized and rewarded for previous educational and occupational experience when that experience results in competence in areas normally addressed by the courses and programs of the College. Advanced standing may be awarded with full credit, up to limits established by each department of the College but not exceeding 30 credit hours. Credits earned in other accredited educational institutions in excess of 30 hours may be accepted by the department.

The College has established the following methods to enable students to gain advanced standing:

CREDIT BY EXAMINATION

Some courses have been identified which may be completed by examination. Testing devices and evaluation procedures will vary according to the course, departmental requirements and the amount of credit being advanced.

To apply for credit by examination, the applicant must have been accepted for admission to the College and have established a transcript. Applications for Credit by Waiver or Examination must be submitted to the department from which credit would be granted.

Applicants for credit by examination must pay the following: 50% of the current per credit hour fee for each credit hour attempted by examination. This fee must be paid prior to the examination.

A "Credit by Examination Notice" will be forwarded to the Campus Registrar for all credit granted by examination. The Registrar will record all credit granted as "Px" (Passed by Examination) on the transcript. No honor points will be awarded and the credit by examination will not be included in the cumulative grade point average (CGPA).

CREDIT BY WAIVER

Some courses and series of courses have been identified which may be waived in meeting program graduation requirements.

Students requesting advanced standing Credit by Waiver must: Complete an Application for Credit by Waiver or Examination and submit the application for evaluation to the department granting the waiver.

Upon completion of the evaluation, submit the application and evaluation to the Campus Registrar for recording on their transcript.

The following entry will be made on the student's transcript for all course credit granted by waiver: "The following program requirements were waived by substituting previous education and/or occupational experience. (list courses waived.) This waiver of program requirements was granted this date _____ by _____ (evaluator) and is in accordance with Department, Campus and Area policies, rules and regulations."

No fee will be charged for advanced credit by waiver.

Credit by Waiver will not be included in calculating student's grade point average (CGPA).

Credit granted by waiver is subject to evaluation by other departments, programs and other institutions and probably would not be accepted as transfer credit by them.

Credit granted by waiver will be contingent upon satisfactory completion of advanced courses.

ADVANCED PLACEMENT

Southeast Community College
Lincoln Campus

Advanced placement in the Automotive Technology Program of the Lincoln Campus of Southeast Community College will be determined on the basis of competencies which the prospective student demonstrates according to the following:

Students Demonstrating Competency No.	Will Receive SCC Quarter Credit in the Amount of	For SCC Course No.	Course Title
1	1	6857	Engine Operation & Design
1	3	6861	Valve Train
1	5	6862	Engine Repair
2	1	6859	Lubrication
3C, D	4	6852	Automotive Electricity
3B	3	6853	Automotive Electronics
3A	3	6855	Automotive Ignition System
3E, F	2	6854	Automotive Electrical Circuits
4	3	6856	Automotive Fuel System
5	5	6881	Auto Air Conditioning
6	1	6858	Cooling System
7A, B, C	1	6864	Automotive Chassis
7D	3	6865	Alignment, Wheels & Tires
8C, D, E	4	6867	Automotive Power Train & Drive Axles
8A, B, F	6	6871	Manual Transmission
9	4	6866	Brake System
10, 11	1-7	6868	Production Training

The program supervisor of the Automotive Technology Program has the responsibility for conducting and evaluating examinations to determine the competency level of students requesting consideration under this agreement.

Examinations used for evaluation purposes will be updated from time to time although every effort will be made to maintain their consistency with the competencies identified in this agreement.

This agreement cannot, however, be considered a contract between Southeast Community College-Lincoln Campus and any prospective student. The Board of Governors of the College reserves the right to make changes in courses required, courses offered, credits waived, credits granted, and in any other matter it deems necessary without revision of this agreement and without notice. Prospective students wishing consideration under this agreement should contact the program supervisor in order to establish and maintain a close working relationship between the College, its program, and the student.

ADVANCED P_ACEMENT

Southeast Community College
Milford Campus

Advanced placement in the Automotive Technology Program of the Milford Campus of Southeast Community College will be determined on the basis of competencies which the prospective student demonstrates according to the following:

Students Demonstrating Competency No.	Will Receive SCC Quarter Credit in the Amount of	For SCC Course No.	Course Title
3	2	4600120	Basic Electrical
3	3	4600121	Cranking Motors . . Ignition Systems
3	3	4600122	Charging Systems
8	3	4600123	Power Trains I
10	2	4600225	Theory of Engine Operation
4	2	4600227	Theory of Fuel System Operation
1	3	4600228	Valve Trains
1, 2, 5, 11	3	4600230	Engine Overhaul and Inspection
4	1	4600232	Fuels and Emission Control Systems
4	5	4600234	Carburetor Operation and Rebuilding

The program chairman of the Automotive Technology Program has the responsibility for conducting and evaluating examinations to determine the competency level of students requesting consideration under this agreement.

Examinations used for evaluation purposes will be updated from time to time although every effort will be made to maintain their consistency with the competencies identified in this agreement.

This agreement cannot, however, be considered a contract between Southeast Community College-Milford Campus and any prospective student. The Board of Governors of the College reserves the right to make changes in courses required, courses offered, credits waived, credits granted, and in any other matters it deems necessary without revision of this agreement and without notice. Prospective students wishing consideration under this agreement should contact the program chairman in order to establish and maintain a close working relationship between the College, its program, and the student.

HIGH SCHOOL CREDIT

Amounts of high school credit are suggested for each competency. It is the responsibility of each educational agency to determine the level of competency and the amount of credit to be awarded.

Competency	Semester Credit Hours
1. A	1
B	1
C	1
D	1
2. A	½
B	½
C	½
D	¼
E	¼
3. A	1
B	1
C	1
D	1
E	½
F	½
4. A	1
B	1
C	½
D	1
E	½
5. A	½
B	½
C	¼
D	¼
E	¼
6. A	½
B	½
C	¼
D	¼
E	¼
F	¼
G	¼
H	¼
7. A	¾
B	½
C	½
D	¾
E	1

Competency	Semester Credit Hours
8. A	1
B	1
C	1
D	1
E	1
F	½
G	1
9. A	1
B	1
C	1
10.	½
11. A	¼
B	¼
C	¼
D	¼
E	¼
F	¼
G	¼
H	¼
I	¼
J	¼
K	¼
L	¼
M	¼
N	¼
O	½

Competencies

A competency consists of three sections or parts that combine to provide a detailed outline of a major task that a student must accomplish to reach one or more previously stated student outcomes. Competencies are described as follows:

a. Task – What the student must do to demonstrate an ability to do the job.

b. Conditions or Limitations – A description of the circumstances under which the student will demonstrate the skill. Usually included are:

   1. time allowance;
   2. tolerances allowed;
   3. references which may be used;
   4. specific tools and materials to be used (common tool lists are generally omitted unless a required usage is to be demonstrated);
   5. work location (if other than school site);
   6. and, other limitations unique to the task.

c. Criteria of Acceptable Performance – Standards described that constitute acceptable performance. These standards must:

   1. be compatible with the task and the condition;
   2. evaluate all components of the conditions;
   3. include the percentage of responses that must be correct if the competency is primarily cognitive;
   4. and, specify the standard for the criteria. This may take the form of a list of criteria, an instructor's checklist, or references to an authoritative manual such as an automotive flat-rate manual.

Represented in the guide are those competencies needed for initial employment. They are not designated or described by grade level. A student may complete all the competencies available at a school if learning capabilities and time permit.

TASK:

To analyze and service the components of the internal combustion engine.

CONDITIONS AND LIMITATIONS:

A. Block and Crankshaft Assembly

Given an internal combustion engine, proper tools and equipment (including a cylinder taper gauge and cam-bearing tool), and possible malfunctions in each of the components (soft plugs, crankshaft, crankshaft main bore and caps, camshaft bearings and camshaft bores, main bearings, flywheel, flywheel ring gear, and harmonic damper), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Piston and Cylinder Assembly

Given an internal combustion engine, proper tools and equipment (including a piston-pin tool and ring compressor), and possible malfunctions in each of the components (pistons, piston rings, piston pins, connecting rods, connecting rod bearings and cylinder bores), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Valve Train Assembly

Given an internal combustion engine, proper tools and equipment, and possible malfunctions in each of the components (camshaft, camshaft drive and thrust control, valve lifters, push rods, rocker arms, rocker arm supports, valve rotators, valve springs, retainers and locks), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

D. Cylinder Head Assembly

Given an internal combustion engine, proper tools and equipment (including a valve and seat grinder, and valve guide knurler), and possible malfunctions in each of the components (valves, valve seats, valve guides, valve seals, valve ports, cylinder head, gaskets and seals), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.

2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.

3. Analyze and correct the malfunction to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)

4. Complete all work in a safe manner using the necessary tools properly.

5. Leave the work area in an orderly condition.

6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the engine lubrication system.

CONDITIONS AND LIMITATIONS:

A. Oil Pump

Given an internal combustion engine, proper tools and equipment, and possible malfunctions in each of the components (housing, oil pump drive, pressure regulating valve, oil pick-up tube, screen, gears, vanes, inner rotors and outer rotors), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct the malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Oil Filters

Given an internal combustion engine, proper tools and equipment (including an oil filter tool), and possible malfunctions in each of the components (housing, container, by-pass valve, gaskets and seals), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct the malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Oil Galleries and Passages

Given an internal combustion engine, proper tools and equipment, and possible malfunctions in each of the components (main bearings, cam bearings, connecting rod bearings, crankshaft, head gasket, oil galleries and plugs, and external supply lines), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

D. Oil Pressure Indicator

Given an internal combustion engine, proper tools and equipment (including a master oil pressure gauge 0-150 p.s.i.), and possible malfunctions in each of the components (bourdon tube gauge, balancing coil gauge and sending unit, and thermostatic gauge and sending unit), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

E. Oil Coolers

Given an internal combustion engine, proper tools and equipment, and possible malfunctions in each of the components (fins or ribs, tubes, housings and core), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.
2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.
3. Analyze and correct the malfunction to specifications in the service manual (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)
4. Complete all work in a safe manner using the necessary tools properly.
5. Leave the work area in an orderly condition.
6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the electrical system.

CONDITIONS AND LIMITATIONS:

A. Ignition System – Conventional

Given a spark-ignited internal combustion engine or an ignition system, proper tools and equipment (including a distributor tester), and possible malfunctions in each of the components (battery, ignition switch, ignition coil, distributor, spark plugs, ignition resister, primary wiring, and secondary wiring), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Ignition System – Electronic

Given a spark-ignited internal combustion engine or an ignition system, proper tools and equipment (including manufacturer's recommended electronic ignition tester), and possible malfunctions in each of the components (battery, ignition switch, ignition coil, distributor, control unit, spark plugs, ignition resister, primary wiring, and secondary wiring), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Cranking System

Given a spark-ignited internal combustion engine or a cranking system, proper tools and equipment (including a battery-starter tester), and possible malfunctions in each of the components (battery, starting switch, magnetic switch, solenoid switch, cranking motor, cranking motor drive, and neutral safety switch), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing or correcting the malfunction.

D. Charging System

Given a spark-ignited internal combustion engine or a charging system, proper tools and equipment (including a generator-regulator tester), and possible malfunctions in each of the components (battery, D.C. or A.C. generator, regulator, dash indicator, and wiring), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

E. Lighting

Given a complete automobile, proper tools and equipment and a possible malfunction in each of the components (headlights and switch, tail lights and switch, turn signal and switch, brake light and switch, dimmer switch, back-up lights and switch, cornering lamps, side markers, license lamp, and underhood and trunk lamp), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

F. Accessories

Given a complete automobile, proper tools and equipment (including a vacuum pump), and possible malfunctions in each of the components (accessory components, i.e.: radio AM/FM; tape deck; motors which drive fans, power antennas, hydraulic pumps, windshield wipers, and windshield washers; buzzers used for attracting attention for ignition, seat belt and doors; solenoids used for door locking, and trunk opening; relays used on horns; and vacuum controls used for vent, door locks, trunk locks, and head light covers), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.
2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.
3. Analyze and correct the malfunction to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)
4. Complete all work in a safe manner using the necessary tools properly.
5. Leave the work area in an orderly condition.
6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the fuel system.

CONDITIONS AND LIMITATIONS:

A. Fuel Supply System

Given a fuel supply system, proper tools and equipment (including a fuel pump pressure gauge, and flow meter), and possible malfunctions in each of the components (fuel tank, fuel lines, fuel cap, fuel level indicator, fuel pump, and fuel filter), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Carburetor System

Given a carburetor system, proper tools and equipment (including a vacuum pump), and possible malfunctions in each of the components (idle circuit, accelerator pump circuit, choke circuit, float circuit, main metering circuit, and power circuit), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Air Cleaner System

Given an air cleaner system, proper tools and equipment (including a vacuum pump), and possible malfunctions in each of the components (filter element, duct valve, and vacuum system), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

D. Emission Control System

1. Crankcase Emission Control System
   Given a vehicle with a crankcase emission control system, proper tools and equipment, and possible malfunctions in each of the components (PCV valve, oil filler cap, air inlet filter, and hoses), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

2. Exhaust Emission Control System (Modified)
   Given a vehicle with an exhaust emission control system (modified), proper tools and equipment (including a vacuum pump), and possible malfunctions in each of the components (carburetor, heated air intake, distributor, intake manifold, and cylinder head), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

3. Exhaust Emission Control System (Air Injection System)
   Given a vehicle with an exhaust emission control system (air injection system), proper tools and equipment (including a vacuum pump), and possible malfunctions in each of the components (air supply pump, air bypass valve, check valve, and air distribution manifold), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

E. Induction System

Given an induction system, proper tools and equipment, and possible malfunctions in each of the components (manifold heat riser, crossover, PCV valve, and intake manifold), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.

2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.

3. Analyze and correct the malfunction to specifications in the service manual (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)

4. Complete all work in a safe manner using the necessary tools properly.

5. Leave the work area in an orderly condition.

6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the accessory system.

CONDITIONS AND LIMITATIONS:

A. Heater System

Given a heater system, proper tools and equipment (including a test light), and possible malfunctions in each of the components (heater motor, heater controls, heater core, water control valve, and connecting hoses), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Air Conditioning System

Given an air conditioning system, proper tools and equipment (including a charging valve, gauge set, compressor tool kit, vacuum pump, and leak detector), and possible malfunctions in each of the components (compressor, compressor clutch, evaporator, expansion valve, condensor, dryer, system controls, compressor controls, and connecting hoses), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Power Seat System

Given a power seat system, proper tools and equipment, and possible malfunctions in each of the components (selector switch, ground, motor, and circuit), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

D. Cruise Control System

Given a cruise control system, proper tools and equipment, and possible malfunctions in each of the components (switch, control unit, linkage, and governor), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

E. Power Window System

Given a power window system, proper tools and equipment, and possible malfunctions in each of the components (motor, switch, master switch, and window guide), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.

2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.

3 Analyze and correct the malfunctions to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)

4. Complete all work in a safe manner using the necessary tools properly.

5. Leave the work area in an orderly condition.

6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the cooling system.

CONDITIONS AND LIMITATIONS:

A. Water Pump

Given an internal combustion liquid cooled engine, proper tools and equipment (including a radiator and cap tester), and possible malfunctions in each of the components (water pump housing, impeller, seals, gaskets, bearings, and pump drive), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Radiator

Given an internal combustion liquid cooled engine, proper tools and equipment (including a radiator and cap tester), and possible malfunctions in each of the components (inlet, outlet, filler cap neck, drain cock, core, storage tanks, expansion and recovery system, and transmission oil cooler), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Radiator Cap

Given an internal combustion liquid cooled engine, proper tools and equipment (including a radiator and cap tester), and possible malfunctions in each of the components (pressure valve, vacuum valve, and cap lock), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

D. Fan

Given an internal combustion liquid cooled engine, proper tools and equipment (including a belt-tension gauge), and possible malfunctions in each of the components (fan drive, shroud, blades, and fluid coupling), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

E. Coolant

Given an internal combustion liquid cooled engine, proper tools and equipment, and a malfunction in the coolant, the student will be able to identify and explain the operation and function of the coolant and be able to diagnose and correct the malfunction. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

F. Connecting Hoses

Given an internal combustion liquid cooled engine, proper tools and equipment, and possible malfunctions in each of the components (hoses, clamps, and connections), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

G. Temperature Indicators

Given an internal combustion liquid cooled engine, proper tools and equipment (including a temperature sensing unit), and possible malfunctions in each of the components (dash indicator, sending unit, and ignition switch), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

H. Thermostat

Given an internal combustion liquid cooled engine, proper tools and equipment (including a thermostat tester), and a malfunction in the thermostat, the student will be able to identify and explain the operation and function of the thermostat and be able to diagnose and correct the malfunction. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.
2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.
3. Analyze and correct the malfunctions to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)
4. Complete all work in a safe manner using the necessary tools properly.
5. Leave the work area in an orderly condition.
6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the suspension system.

CONDITIONS AND LIMITATIONS:

A. Front End Suspension System

Given a front end suspension system, proper tools and equipment (including ball joint tools and reamer set), and possible malfunctions in each of the components (ball joint, control arm bushing, spring, shock absorber, and king pin), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Rear Suspension System

Given a rear suspension system, proper tools and equipment (including an axle puller, seal puller, press, and hub puller), and possible malfunctions in each of the components (rear spring, stablizer bushing, rear axle housing, rear axle bearing, and shock absorber), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Steering System – Manual

Given a manual steering system, proper tools and equipment (including tie rod tool, ball joint tools, and idler arm bushing tool), and possible malfunctions in each of the components (ball joint, tie rod end, idler arm, drag link, and sector), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

D. Steering System – Power

Given a power steering system, proper tools and equipment (including tie rod tool, ball joint tools, idler arm tool, pulley puller and belt tension gauge), and possible malfunctions in each of the components (ball joint, hydraulic pump, drag link, drive belt steering sector, and pitman arm), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

E. Front Wheel Alignment

Given an automotive chassis, proper tools and equipment (inlcuding front end alignment machine), and possible malfunctions or adjustments in each of the component (tires, wheels, camber, caster, and toe-in), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction or adjustments in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.
2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.
3. Analyze and correct the malfunctions to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)
4. Complete all work in a safe manner using the necessary tools properly.
5. Leave the work area in an orderly condition.
6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the power train.

CONDITIONS AND LIMITATIONS:

A. Friction Clutch and Pressure Release Bearing

Given a friction clutch system, proper tools and equipment (including a clutch disc aligning tool), and possible malfunctions in each of the components (flywheel, pressure release bearing, clutch disc, pressure plate, pilot bearing, release fork, pedal, and linkage), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Three and Four Speed Standard Transmissions

Given a standard transmission, proper tools and equipment (including a bearing puller), and possible malfunctions in each of the components (pinion shaft [input], pinion shaft bearing, syncronizer's, low-reverse slider, speedometer drive-gear, counter gear and shaft, reverse idler, shifting detents, linkage, anti-friction bearings, and lubricant), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Drive Shaft and Universal Joints

Given a drive shaft (one or two piece) with universal joints, proper tools and equipment (including a universal joint tool) and possible malfunctions in each of the components (universal joint, drive shaft, hanger bearing, and slip joint), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

D. Differential

Given a differential, proper tools and equipment (including a dial indicator, differential housing tool, and press), and possible malfunctions in each of the components (pinion and/or ring gear, pinion bearings, carrier bearings, differential pinion gear, and lubricant), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

E. Rear Axle Shaft and Housing

Given a rear axle and housing, proper tools and equipment (including an axle puller, seal puller, hub puller, and press), and possible malfunctions in each of the components (axle seal, axle bearing, wheel lugs, housing vent, and axle, the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

F. The Overdrive System

Given an overdrive unit, proper tools and equipment, and possible malfunctions in each of the components (planetary gears, shifting solenoid, shifting linkage, governor, and lubricant), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

G. Automatic Transmissions

Given an automatic transmission, proper tools and equipment (including a vacuum pump, and pressure pump with gauge), and possible malfunctions in each of the components (linkage, modulator valve, torque converter, filter, fluid, vent tube, and seals), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.
2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.
3. Analyze and correct the malfunctions to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)
4. Complete all work in a safe manner using the necessary tools properly.
5. Leave the work area in an orderly condition.
6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the brake system.

CONDITIONS AND LIMITATIONS:

A. Drum Brake System

Given a drum brake system, proper tools and equipment (including a drum lathe, shoe-arcing machine, pressure bleeder, cylinder hone, and brake tools), and possible malfunctions in each of the components (brake drum, wheel cylinder, master cylinder, brake shoes, combination valve, hydraulic lines, and fluid), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

B. Disc Brake System

Given a disc brake system, proper tools and equipment (including a rotor lathe, caliper seal tool, and caliper hose), and possible malfunctions in each of the components (brake pad, rotor, master cylinder, caliper, combination valve, hydraulic lines, and fluid), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

C. Power Brake System

Given a power brake system, proper tools and equipment, and possible malfunctions in each of the components (power unit, master cylinder, vacuum system, brake lines, and fluid), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.
2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.
3. Analyze and correct the malfunctions to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)
4. Complete all work in a safe manner using the necessary tools properly.
5. Leave the work area in an orderly condition.
6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To analyze and service the components of the exhaust system.

CONDITIONS AND LIMITATIONS:

Given an automobile exhaust system (heat riser and exhaust manifold gaskets, pipes, mufflers, catalytic converter, and fasteners), proper tools and equipment (including an air chisel, acetylene torch, and tail pipe expander), and possible malfunctions in each of the components (exhaust heat control valve, gaskets, exhaust pipes [Y-pipes on V-8 models], muffler, tail pipe(s), resonator(s), manifold, catalytic converter, and fastening devices), the student will be able to identify and explain the operation and function of each component and be able to diagnose and correct any malfunction in any of the components. The flat rate manual is to be used. Reference material may be used only when analyzing and correcting the malfunction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

For each of the given conditions the student will:

1. Identify the components listed in each condition and explain the function and operation of each component with 85% accuracy.
2. Test *all* components by use of appropriate equipment and according to procedures given in the respective service manual.
3. Analyze and correct the malfunctions to specifications in the service manual. (NOTE: Only one malfunction in one component of each condition is required for sufficient evaluation.)
4. Complete all work in a safe manner using the necessary tools properly.
5. Leave the work area in an orderly condition.
6. Accomplish the task within the given flat rate multiplied by two.

TASK:

To perform maintenance operations on the automobile.

A. Service Exhaust System

CONDITIONS AND LIMITATIONS:

Given an exhaust system and proper tools and equipment, the student will be able to describe the operation and function of the exhaust system and perform the task of replacing the muffler, tail pipe assembly and hangers using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the function of each component of the exhaust system.
2. Accomplish the task according to specifications and procedures in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

B. Oil and Filter Change

CONDITIONS AND LIMITATIONS:

Given an automobile engine and proper tools and equipment, the student will be able to describe the operation and function of the oil and oil filter and change the oil filter using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation and function of the oil and oil filter.
2. Accomplish the task according to specifications in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

C. Lubricate Chassis

CONDITIONS AND LIMITATIONS:

Given an automobile and proper tools and equipment (including a grease gun needle point adaptor), the student will be able to describe the operation and function of the chassis and lubricate it using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation and function of the chassis.
2. Accomplish the task according to specifications and procedures in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

D. Test Coolant

CONDITIONS AND LIMITATIONS:

Given an automobile cooling system and proper tools and equipment, the student will be able to describe the operation and function of the coolant and test it using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation and function of coolant in the cooling system.
2. Test the coolant according to procedures furnished with test equipment.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

E. Service Cooling System

CONDITIONS AND LIMITATIONS:

Given an automobile cooling system and proper tools and equipment (including a radiator and cap tester and flushing adaptor), the student will be able to describe the operation and function of the cooling system and flush and test the system using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation and function of the cooling system.
2. Flush and test the system according to procedures found in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

F. Pack and Adjust Front Wheel Bearings

CONDITIONS AND LIMITATIONS:

Given a front wheel system and proper tools and equipment (including a torque wrench), the student will be able to describe the operation and function of the front wheel system and pack and adjust the front wheel bearings using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation and function of the front wheel system.
2. Pack and adjust the bearings according to procedures found in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

G. Replace Windshield Wiper Blade

CONDITIONS AND LIMITATIONS:

Given a windshield wiper system and proper tools and equipment, the student will be able to describe the operation and function of the system and change the windshield wiper blades using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation and function of the windshield wiper system.
2. Remove the old blades and replace with new blades according to procedures found in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

H. Tire Maintenance

CONDITIONS AND LIMITATIONS:

Given an automobile wheel and tire and proper tools and equipment (including tire machine and tire balancer), the student will be able to describe the operation and demount, repair leak, replace valve stem and mount and balance the tire using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain demounting and mounting of a tire, and the procedure used in repair and balancing.
2. Demount, repair, mount and balance the tire according to procedures found in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

I. Battery Inspection, Maintenance and Testing

CONDITIONS AND LIMITATIONS:

Given an automobile battery and proper tools and equipment (including hydrometer), the student will be able to describe installation and maintenance procedures, inspect for leaks and corrosion damage, clean case, posts and cables, and test specific gravity and electrolyte level, using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain installation and maintenance procedures of a battery.
2. Visually inspect for leaks, corrosion, damage to case, posts and cables, and electrolyte level according to procedures found in the service manual.
3. Accurately test the specific gravity and electrolyte level.
4. Correct all faults indicated by inspection.
5. Complete all work in a safe manner using the necessary tools properly.
6. Leave the work area in an orderly condition.

J. Check Automatic Transmission Fluid

CONDITIONS AND LIMITATIONS:

Given an automobile with an automatic transmission, the student will be able to describe the operation of the automatic transmission and check and correct the fluid level to specifications using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation of the automatic transmission.
2. Check and correct fluid level to specifications according to procedures found in the service manual.

3. Complete all work in a safe manner using the necessary tools properly.

4. Leave the work area in an orderly condition.

K. Change Automatic Transmission Fluid

CONDITIONS AND LIMITATIONS:

Given an automobile with an automatic transmission and proper tools and equipment, the student will be able to change the automatic transmission fluid using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the steps in performing the operation.

2. Drain and refill the automatic transmission according to procedures found in the service manual.

3. Complete all work in a safe manner using the necessary tools properly.

4. Leave the work area in an orderly condition.

L. Inspect, Change and Adjust V-belt

CONDITIONS AND LIMITATION:

Given an automobile engine and proper tools and equipment (including belt tension gauge), the student will be able to describe the operation and function of the V-belt, inspect for replacement, and install new belts using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation and function of the various V-belts.

2. Inspect belt condition and determine need for replacement as indicated by cracks, frays, cuts and/or glazing.

3. Remove defective belts, install new belts and adjust tension according to procedures found in the service manual.

4. Complete all work in a safe manner using the necessary tools properly.

5. Leave the work area in an orderly condition.

M. Check and Correct Differential and Standard Transmission Lubricant Level

CONDITIONS AND LIMITATIONS:

Given an automobile differential and/or standard transmission and proper tools and equipment, the student will be able to describe the operation and lubricate as needed using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the steps in performing the operation.
2. Inspect the level of differential and/or standard transmission lubricants and add lubricant if necessary according to procedures found in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

N. Align Headlights

CONDITIONS AND LIMITATIONS:

Given an automobile headlight system and proper tools and equipment (including a headlight aligning instrument that attaches to the headlight), the student will be able to describe the operation and align the headlights using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the steps in performing the operation.
2. Test and adjust lights according to procedures found in the service manual.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

O. Service Station Island

CONDITIONS AND LIMITATIONS:

Given an automobile at a service island and proper tools and equipment, the student will be able to describe the operations and perform the tasks of fueling the automobile, checking tires and inflating, washing windows, checking coolant level, checking batteries and filling, measuring oil level, and adding oil if needed. The student will be able to perform the tasks using reference materials as needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Explain the operation of the service island.
2. Fuel auto, wash windows, measure and add oil, check tire pressure and inflate, check coolant level, check batteries and fill if needed.
3. Complete all work in a safe manner using the necessary tools properly.
4. Leave the work area in an orderly condition.

Enabling Tasks

The enabling tasks are the activities necessary for developing a job skill. The completion of all enabling tasks for a competency leads to achievement of that competency. They may become daily or weekly lesson plans if teachers develop conditions and criteria similar to those developed for the competencies. The enabling tasks have been suggested by people in business and industry.

COMPETENCY NO. 1 THROUGH COMPETENCY NO. 11

GENERAL TASKS

- Analyze causes of vehicle failure
- Conduct spot checks on malfunction
- Perform quality checks on vehicles after maintenance
- Annotate and process records on vehicles being serviced and repaired
- Complete forms when servicing vehicles
- Enter work performed on work orders
- Initiate requests for parts
- Use power and hand tools safely
- Use proper service manuals
- Visually inspect conditions of units
- Identify and explain the function and operation of each component of each competency

COMPETENCY NO. 1 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE INTERNAL COMBUSTION ENGINE

GENERAL TASKS

- Clean component parts
- Replace gaskets and seals

A. BLOCK AND CRANKSHAFT ASSEMBLY

- Disassemble engine
- Inspect and correct bearing fit
- Inspect crankshaft assembly using micrometers and other equipment
- Inspect cylinder visually and measure taper using taper gauge
- Remove engines from vehicles
- Replace crankshaft and bearings
- Replace flywheel
- Replace flywheel ring gears
- Replace oil pan and valve covers
- Replace camshaft bearings using cam bearing tool
- Replace soft plugs

B. PISTON AND CYLINDER ASSEMBLY

- Disassemble engines
- Fit piston pins using piston pin tool
- Inspect and correct connecting rod bearing fit using plasti-gauge
- Replace connecting rods and bearings
- Replace oil pan and valve covers
- Replace rings on pistons
- Replace pistons using piston ring compressor
- Inspect and gauge cylinder bores

C. VALVE TRAIN ASSEMBLY

- Diagnose valve train malfunctions
- Inspect bearing fit
- Replace valve covers
- Replace timing gears and chains
- Replace valve lifters
- Replace camshaft
- Replace or recondition rocker arms
- Replace rocker arm supports

D. CYLINDER HEAD ASSEMBLY
Adjust valves
Diagnose head malfunctions
Grind valves and seats using valve and seat grinder
Inspect head for warp
Machine valve guides for special seals
Replace head gaskets
Replace valves using valve spring compressor
Replace or knurl valve guides using guide knurler
Replace valve seats
Run compression test with compression tester

COMPETENCY NO. 2 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE ENGINE LUBRICATION SYSTEM

GENERAL TASKS
Clean component parts
Replace gaskets and seals
Perform operational inspections of engine lubrication systems using test gauges

A. OIL PUMP
Replace oil pumps
Service vehicles with oil

B. OIL FILTERS
Change oil and filters using oil filter tool

C. OIL GALLERIES AND PASSAGES
Follow general task procedures

D. OIL PRESSURE INDICATOR
Use master oil pressure gauge

E. OIL COOLERS
Service vehicles with oil

COMPETENCY NO. 3 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE ELECTRICAL SYSTEM

GENERAL TASKS
Perform operational inspections of electrical systems
Replace chassis and underhood wiring
Test battery
Locate and repair shorts and open circuits in wiring
Clean component parts

A. IGNITION SYSTEM – CONVENTIONAL
Analyze or adjust engine performance using engine analyzer
Clean, gap, and test spark plugs
Inspect secondary circuit leads, plug wires, distributor cap and rotor
Inspect and repair ignition switch, resistor, wiring, coil, points, and condensor of the primary circuit
Measure resistance in secondary wires
Repair distributors and test on distributor tester
Replace and adjust distributors
Set ignition timing using the timing light

B. IGNITION SYSTEM – ELECTRONIC
Analyze or adjust engine performance using engine analyzer
Clean, gap, and test spark plugs
Inspect secondary circuit leads, plug wires, distributor cap and rotor
Inspect and test control unit, pick-up coil and ballast resistor in primary circuit
Test system with electronic ignition tester
Measure resistance in secondary wires
Repair distributors and test on distributor tester
Replace and adjust distributors
Set ignition timing with timing light

C. CRANKING SYSTEM
Analyze malfunctions in the cranking system
Replace solenoids
Repair cranking motor
Replace cranking motor
Replace batteries, cables, and battery boxes
Use battery-starter tester

D. CHARGING SYSTEM
Evaluate alternator, generator and regulator output with generator-regulator tester
Repair or replace charging system regulators
Repair generators or alternators
Replace generators or alternators
Replace batteries, cables, and battery boxes
Replace dash indicator

E. LIGHTING
Adjust headlights
Adjust, repair, or replace backup light switches
Perform operational inspections of lighting systems
Repair or replace fuse block assembly
Repair or replace lighting system components
Repair or replace switches
Replace light bulbs
Adjust or replace stop-light switch
Test and rewire dash units

F. ACCESSORIES
Repair or replace fuse block assembly
Replace or repair switches
Repair solenoids
Repair windshield wiper mechanisms or controls
Test and repair automatic alarm systems of safety items
Test and rewire dash units
Service or replace units in vacuum control systems

COMPETENCY NO. 4 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE FUEL SYSTEM

GENERAL TASKS
- Perform operational inspections
- Clean component parts

A. FUEL SUPPLY SYSTEM
- Clean or replace fuel filter units
- Clean component parts
- Inspect, service or replace gas tank, cap and fuel level indicator
- Measure fuel flow and pressure using flow meter
- Remove, service or replace fuel pumps
- Repair or replace fuel lines and hoses
- Test fuel pump pressure with fuel pump pressure gauge

B. CARBURETOR SYSTEM
- Adjust carburetor
- Clean carburetor
- Inspect, clean and adjust choke unit (automatic and manual) using vacuum pump
- Install carburetors
- Repair or service carburetors

C. AIR CLEANER SYSTEM
- Inspect, service or replace carburetor air cleaner
- Inspect vacuum gates using vacuum pump to test

D. EMISSION CONTROL SYSTEM
- Inspect exhaust systems
- Repair or service exhaust emission control systems
- Service or replace manifold heat controls
- Service or replace units in vacuum systems using vacuum pump to check system
- Repair or service crankcase ventilation system

E. INDUCTION SYSTEM
- Repair or service exhaust emission control systems
- Service or replace manifold heat controls
- Service or replace units in vacuum systems

COMPETENCY NO. 5 -- TO ANALYZE AND SERVICE THE COMPONENTS OF THE ACCESSORY SYSTEM

GENERAL TASKS
- Locate and repair shorts and open circuits in wiring
- Perform operational inspections of systems
- Repair or replace fuse block assembly
- Repair or replace switches
- Replace chassis and under-hood wiring

A. HEATER SYSTEM
Replace heater hoses
Repair automatic a/c and heater system vacuum and electrical circuits
Diagnose heating system malfunctions
Replace heater water control valve
Remove and repair or replace heater core
Service heater control components
Service or replace heater motor using test light

B. AIR CONDITIONING SYSTEM
Inspect and refill system with refrigerant
Diagnose air conditioning malfunctions
Pressure test, performance test, and leak test the system using vacuum pump gauges and leak detector
Repair or replace air conditioning compressor
Repair automatic a/c heater system vacuum and electrical circuits
Replace compressor seals using seal installing tool
Replace condenser in air conditioning unit
Replace air conditioner fan motor
Replace evaporator in air conditioning unit
Replace dryer in air conditioning unit
Replace expansion valve in air conditioning unit
Replace refrigerant control valve or diaphragm in air conditioning unit
Service air conditioner control cables and switches
Replace hoses
Repair or replace air conditioner compressor clutch
Service or replace system controls
Service or replace compressor controls

C. POWER SEAT SYSTEM
Follow general task procedures

D. CRUISE CONTROL SYSTEM
Follow general task procedures

E. POWER WINDOW SYSTEM
Follow general task procedures

COMPETENCY NO. 6 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE COOLING SYSTEM

A. WATER PUMP
Replace water pump
Analyze problem with radiator and cap tester

B. RADIATOR
Check overflow tank and accessories
Use radiator and cap tester
Remove and reinstall radiators

C. RADIATOR CAP
Test with tester and replace coolant pressure cap

D. FAN
Inspect, adjust, and replace fan
Replace belts using belt tension gauge
Replace fluid coupling unit

E. COOLANT
Check coolant freezing point with coolant tester
Check coolant temperature

F. CONNECTING HOSES
Replace radiator hoses
Replace heater hoses

G. TEMPERATURE INDICATORS
Test units for proper function
Replace light bulbs or gauges
Replace sending units

H. THERMOSTAT
Test thermostat with tester
Replace thermostat

COMPETENCY NO. 7 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE SUSPENSION SYSTEM

GENERAL TASKS
Clean component parts

A. FRONT END SUSPENSION SYSTEM
Lubricate ball joints
Replace ball joints using ball joint tool
Replace front suspension control arms and bushings
Replace shock absorbers and mounting
Replace coil spring
Replace king pin

B. REAR SUSPENSION SYSTEM
Repair or replace rear suspension system
Replace rear axle bearing using press
Replace shock absorbers and mounting
Remove and replace rear axle using axle puller
Remove and replace seals using seal puller and seal driver

C. STEERING SYSTEM – MANUAL
Adjust worm and sector in steering box
Repair or replace manual steering components
Replace pivot points on manual steering linkage using tie rod and idler arm tools
Replace ball joints using ball joint tool

D. STEERING SYSTEM – POWER
Adjust worm and sector in steering box
Replace seals on integral steering sector
Repair or replace power steering pumps
Replace belts and set tension with tension gauge
Replace pivot points on power steering linkage using tie rod tool
Service filter in power steering
Replace pulley using pulley puller

E. FRONT WHEEL ALIGNMENT
Inspect tires and wheels
Inspect and align front end on alignment machine
Road test

COMPETENCY NO. 8 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE POWER TRAIN

GENERAL TASKS
Perform operational inspections of units
Clean component parts

A. FRICTION CLUTCH AND PRESSURE RELEASE BEARING
Resurface or replace flywheel
Adjust mechanical-type clutch and linkage
Replace mechanical-type clutch assembly using disc aligning tool
Replace pilot bearing
Replace pressure release bearing

B. THREE AND FOUR SPEED STANDARD TRANSMISSIONS
Adjust external shift linkage on manual transmissions
Lubricate speedometer cable, drive gear, and housing
Rebuild manual transmission (major repairs)
Replace drive line seal
Use bearing puller in transmission disassembly
Replace a manual transmission
Replace manual transmission gaskets and seal
Replace speedometer cable, drive gear, and housing
Replace transmission mount

C. DRIVE SHAFT AND UNIVERSAL JOINTS
Lubricate universal joints
Repair or replace slip joints or universal joints using universal joint tool
Replace drive line seals with seal puller and driver

D. DIFFERENTIAL
Repair or replace differentials using differential housing tool
Repair or replace spider gear
Replace drive line seals with use of seal puller and driver
Replace pinion seal
Set up ring gear and pinion using dial indicator

E. REAR AXLE SHAFT AND HOUSING
Replace differential
Replace drive line seals with use of seal puller and driver
Replace rear-axle shaft, bearings and seal using press to replace bearing

F. THE OVERDRIVE SYSTEM
- Analyze and repair electrical control circuit and components for overdrive unit
- Use test light to analyze electrical problems
- Rebuild overdrive unit
- Replace drive line seals using seal puller and driver

G. AUTOMATIC TRANSMISSIONS
- Replace transmission mounts
- Adjust floor shift linkage
- Adjust linkage from steering column to automatic transmission
- Adjust linkage from engine to automatic transmission
- Diagnose, replace or adjust modulators using vacuum pump to test unit
- Inspect and repair transmission cooling system
- Inspect and repair converter
- Make external adjustment of bands on automatic transmission
- Remove and install automatic transmission
- Replace external seals, gaskets, and lines on automatic transmission
- Pressure-test transmission using pressure pump
- Replace or adjust neutral switch
- Service automatic transmission
- Service filter and check transmission cooling system
- Lubricate speedometer cable, drive gear, and housing
- Replace speedometer cable, drive gear, and housing

COMPETENCY NO. 9 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE BRAKE SYSTEM

GENERAL TASKS
- Perform operational inspection of units
- Replace brake hoses and lines
- Clean component parts

A. DRUM BRAKE SYSTEM
- Adjust brakes using brake adjusting tool
- Adjust hand brake linkage
- Bleed brake system using pressure bleeder
- Free-up parking brake cables
- Inspect and turn brake drums using drum lathe
- Inspect, repair or replace self-adjusters
- Recondition backing plates
- Repair or replace master cylinder
- Replace hydraulic combination valve
- Repair or replace wheel cylinder
- Replace brake shoes and arc to fit machined drum
- Replace hand brake linkage

B. DISC BRAKE SYSTEM
- Bleed brakes using pressure bleeder
- Inspect and replace brake pads
- Inspect and turn rotor
- Repair or replace master cylinder
- Replace hydraulic combination valves
- Repair or replace wheel cylinder

C. POWER BRAKE SYSTEM
Replace power brake unit
Replace vacuum hoses
Replace or repair master cylinder

COMPETENCY NO. 10 – TO ANALYZE AND SERVICE THE COMPONENTS OF THE EXHAUST SYSTEM

Replace muffler
Replace tail pipe assembly
Inspect and replace exhaust manifold
Replace clamps and hangers
Replace inlet pipe

COMPETENCY NO. 11 – TO PERFORM MAINTENANCE OPERATIONS ON THE AUTOMOBILE

A. SERVICE EXHAUST SYSTEM
Replace muffler
Replace tail pipe assemblies
Replace pipe hangers

B. OIL AND FILTER
Change oil and filter

C. LUBRICATE CHASSIS
Lubricate ball joints
Lubricate the front suspension

D. TEST COOLANT
Check coolant freezing point using hydrometer

E. SERVICE COOLING SYSTEM
Chemically clean and flush cooling system
Winterize cooling system
Inspect radiator cap and check with cap tester
Check cooling system for leaks using pressure tester

F. SERVICE FRONT WHEEL BEARINGS
Inspect wheel bearings
Replace front wheel bearing grease seals using seal driver
Wash bearings
Repack front wheel bearings
Adjust front wheel bearings using torque wrench

G. SERVICE WINDSHIELD WIPER BLADES
Inspect and test windshield wiper blades and arms
Replace wiper blades

H. TIRE MAINTENANCE
Inspect tires and wheels
Balance wheels and tires using tire balancer
Remove, repair and replace tires using tire machine

I. BATTERY INSPECTION, MAINTENANCE AND TESTING
Clean battery and holder
Test battery electrolyte using hydrometer
Test battery voltage using voltmeter
Replace battery
Replace battery cables

J. CHECK AUTOMATIC TRANSMISSION
Service automatic transmission
Check fluid level

K. CHANGE AUTOMATIC TRANSMISSION FLUID
Service filter and check transmission cooling system
Replace pan gasket
Check fluid level

L. INSPECT, CHANGE AND ADJUST V-BELT
Replace belts and set tension using belt tension gauge

M. CHECK AND CORRECT DIFFERENTIAL AND STANDARD TRANSMISSION LUBRICANT LEVEL
Add lubricant to system

N. ALIGN HEADLIGHTS
Adjust headlights using headlight aimers

O. SERVICE STATION ISLAND
Service vehicles with fuel and oil
Check tires and inflate
Wash windows
Check cooling systems
Check batteries

Glossary

Items included are subject to different interpretations. These definitions are applicable for use in context of this material.

Alternator
The name given to a diode-rectified automotive generator.

Analyze
To separate and identify parts or problems.

Appropriate equipment
Tool or tools used to properly repair unit

Back Flush
A procedure used to clean a system by forcing reverse flow from an external source.

Ball Joint
A suspension attachment connecting the knuckle to the control arms allowing movement upward and downward as well as rotation.

Bearing
The surface that supports a load.

Camshaft
A shaft on which lobes and bearing journals are located. Used to open valves.

Component
One of the parts.

Correct (malfunction)
To repair, replace or adjust to specifications.

Crankshaft
The part of the engine that changes the reciprocating motion of the pistons into rotary motion.

Cycle
Series of events or operations that happen regularly and lead back to the starting point.

Describe
To give an account of.

Diagnose
Identify problem.

Explain
To make plain - expound.

Flat Rate Manual
Book used as guide for time and charge in repair work.

Flywheel
A weighted disc on a crankshaft that provides inertia to the crankchaft from power stroke to power stroke.

Function
The proper operation of a unit or part.

Hydrometer
A floating device that measures specific gravity of a fluid by the depth the float sinks into the fluid.

Malfunction
Improper operation of a unit or a part.

Oil Seal
A device to keep oil from leaking out of a compartment. It usually refers to a dynamic seal around a rotating shaft.

Operation
Way of operating or functioning

Procedure
Step-by-step process to be followed.

Reference Material
Trades literature manuals or texts used as guide in repair of components.

Retainer
A device to hold parts together.

Service
Repair or replace to achieve proper operation.

Specification
A guide-line of limits and tolerances in auto repair.

Torque
Measurement of turning effort.

Valve
A device that will open or seal an opening.

Individual Student Record

A complete and accurate record may be used by students for job applications and for planning post-secondary education. For reference purposes, photocopies of individual student records may be given to the student. Original copies of all records should remain in the Student Services Department of the school.

AUTO MECHANICS

School Stamp

Name of Student

This is to certify that the above named student has demonstrated proficiency in the following tasks:

Comp	Task	Date Completed	Instructor
1	Analyze & service engine A. Block & crankshaft B. Piston & cylinder C. Valve Train D. Cylinder Head		
2	Analyze & service engine lube system A. Oil pump B. Oil filters C. Oil galleries & passages D. Oil pressure indicator E. Oil coolers		
3.	Analyze & service electrical system A. Ignition system - conventional B. Ignition system - electronic C. Cranking system D. Charging system E. Lighting F. Accessories		
4.	Analyze & service fuel system A. Fuel supply system B. Carburetor system C. Air cleaner system D. Emission control system E. Induction system		
5.	Analyze & service accessory system A. Heater system B. Air conditioning system C. Power seat system D. Cruise control system E. Power window system		
6.	Analyze & service cooling system A. Water pump B. Radiator C. Radiator cap D. Fan E. Coolant F. Connecting Hoses G. Temperature indicators H. Thermostat		

School Official Signature

Comp	Task	Date Completed	Instructor
7	Analyze and service suspension system A. Front end suspension system B. Rear suspension system C. Steering system - manual D. Steering system - power E. Front wheel alignment		
8.	Analyze & service power train A. Friction clutch & throw-out bearing B. 3 & 4 speed standard transmissions C. Drive shaft & universal joints D. Differential E. Rear axle shaft & housing F. Overdrive system G. Automatic transmissions		
9.	Analyze & service brake system A. Drum brake system B. Disc brake system C. Power brake system		
10.	Analyze and service exhaust system		
11.	Perform maintenance operations A. Service exhaust system B. Oil & filter change C. Lubricate chassis D. Test coolant E. Service cooling system F. Pack & adjust front wheel bearings G. Replace windshield wiper blade H. Tire maintenance I. Battery inspection, maintenance & testing J. Check automatic transmission fluid K. Change automatic transmission fluid L. Inspect, change, adjust V-belts M. Check, correct diff. & stand. trans. grease lvl. N. Align headlights O. Service station island		

Student signature

Class Competency Record

It is important that complete and accurate competency records be maintained for all students. Teachers, administrators, students and people in business and industry may benefit from this information.

AUTO MECHANICS

STUDENT RECORD CLASS ROSTER

Block & crankshaft	Piston & cylinder	Valve train	Cylinder head	Oil pump	Oil filters	Oil galleries & passage	Oil pressure indicator	Oil coolers	Ignition system - conventional	Ignition system - electronic	Cranking system	Charging system	Lighting	Accessories	Fuel supply system	Carburetor system	Air cleaner system	Emission control system	Induction system	Heater system	Air conditioning system	Power seat system	Cruise control system	Power window system	Water pump	Radiator	Radiator cap	Fan	Coolant	Connecting Hoses	Temperature indicators	Thermostat				
1				2					3						4					5					6										
A	B	C	D	A	B	C	D	E	A	B	C	D	E	F	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F	G	H			

AUTO MECHANICS

STUDENT RECORD CLASS ROSTER

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